WHAT IS CLAIMED IS:

1. A preform mold apparatus for brake friction components, which apparatus comprises a constraint fixture having a bottom plate and an internal area corresponding in shape to the shape of a desired preform, said internal area being defined by an annular ejector plate, a inner wall, an outer wall, and an annular top plate.

2. The apparatus of claim 1, wherein the top plate and the ejector plate of said constraint fixture are perforated.

3. The apparatus of claim 2, wherein the bottom plate comprises holes to facilitate ejection of the ejector plate.

4. The apparatus of claim 1, further comprising locking means to maintain said top plate in place in the constraint fixture.

5. The apparatus of claim 4, wherein said locking means comprises a plurality of locking cams (5).

6. The apparatus of claim 1, further comprising annular inner and outer filling rings (13, 12) to facilitate loading of the mold with fibrous materials.

7. The apparatus of claim 1, further comprising means for lifting the constraint fixture out of a mold.

8. The apparatus of claim 7, wherein said lifting means comprises an eyebolt fixed in a hole in the bottom plate.

9. A method of manufacturing preforms for brake friction components, which method comprises the steps of

placing carbon fiber materials into a constraint fixture in a mold apparatus in the absence of binders,

compressing said carbon fiber materials to form a fibrous matrix,

removing the constraint fixture containing the compacted fibrous materials from the mold apparatus, and

subjecting said materials in said constraint fixture to densification to produce a brake friction component preform.

10. The method of claim 9, wherein said carbon fiber materials comprise loose fibers, and optionally, fillers and/or additives.

11. The method of claim 9, wherein said loose fibers are produced by chopping continuous fiber tow and wherein the chopped fibers are sprayed into the constraint fixture.

12. The method of claim 11, further comprising the step of lining said constraint fixture with a veil prior to spraying the chopped fibers into said constraint fixture.

13. The method of claim 9, wherein binderless chopped fibers are pressed at a pressure of about 3-10 atmospheres to compact them to a density suitable for densification.

14. The method of claim 9, wherein the densification step includes one or more of Resin Transfer Molding, resin or pitch infiltration, and Carbon Vapor Deposition.

15. The method of claim 9, wherein said brake friction component preform is configured as an aircraft landing system brake disc.